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Original Research

Prevalence of Non Alcoholic Fatty Liver in Pre Diabetes

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Abstract:

Background: Non-alcoholic fatty liver disease (NAFLD) is a common metabolic disorder characterized by the accumulation of fat in the liver, often associated with obesity and insulin resistance. Pre-diabetes, a condition characterized by elevated blood glucose levels that are not yet in the diabetic range, is considered a risk factor for NAFLD. This study aims to investigate the prevalence of NAFLD in individuals with pre-diabetes and its associated factors.

Materials and Methods: A cross-sectional study was conducted among 200 adults with pre-diabetes, aged 30-60 years, in DR.K.K.BM Subharti Hospital, G.B.C.M over a period of one year. Diagnosis of pre-diabetes was based on American Diabetes Association criteria. Participants underwent clinical assessments, including anthropometric measurements, fasting blood glucose, lipid profile, and liver function tests. Abdominal ultrasonography was used to diagnose NAFLD. Data were analyzed using descriptive statistics and logistic regression.

Results: Among the 200 participants with pre-diabetes, 100 (50%) were found to have NAFLD based on abdominal ultrasonography. The mean age of participants with NAFLD was 45.6 years, and 55% were male. The prevalence of obesity (BMI > 30 kg/m²) among those with NAFLD was 42%. Participants with NAFLD had significantly higher fasting blood glucose levels (mean 110 mg/dL) compared to those without NAFLD (mean 98 mg/dL). Logistic regression analysis revealed that obesity and elevated fasting blood glucose levels were significant independent predictors of NAFLD in individuals with pre-diabetes.

Conclusion: This study highlights a high prevalence of NAFLD in individuals with pre-diabetes, emphasizing the importance of early screening and intervention in this population. Obesity and elevated fasting blood glucose levels were identified as key risk factors for NAFLD in pre-diabetic individuals. Early lifestyle modifications and close monitoring of liver health should be considered to prevent the progression of NAFLD in this at-risk population.

Keywords: Non-alcoholic fatty liver disease, NAFLD, Pre-diabetes, Prevalence, Obesity, Insulin resistance, Risk factors, Abdominal ultrasonography.

Introduction:

Non-alcoholic fatty liver disease (NAFLD) has emerged as a prevalent metabolic disorder, characterized by the excessive accumulation of fat within the liver, in the absence of significant alcohol consumption (1). With the rising global epidemic of obesity and diabetes, NAFLD has become a critical public health concern (2). Pre-diabetes, a metabolic condition characterized by impaired glucose tolerance or elevated fasting blood glucose levels, is recognized as a significant risk factor for the development and progression of NAFLD (3). The interplay between pre-diabetes and NAFLD represents a growing clinical challenge that warrants thorough investigation.Recent epidemiological studies have suggested that individuals with pre-diabetes are more likely to develop NAFLD compared to those with normoglycemia (4). However, comprehensive studies examining the prevalence and associated factors of NAFLD in individuals with pre-diabetes are limited. Understanding the prevalence of NAFLD in this specific population and identifying key risk factors is crucial for early intervention and management. This study aims to address this knowledge gap by investigating the prevalence of NAFLD in individuals with pre-diabetes and identifying potential contributing factors. We hypothesize that the prevalence of NAFLD will be higher in individuals with pre-diabetes compared to the general population. Additionally, we will explore the relationship between obesity, insulin resistance, and NAFLD in this context. In this paper, we present the results of a cross-sectional study conducted among 200 adults with pre-diabetes, providing insights into the prevalence and risk factors associated with NAFLD within this population. The findings from this study have the potential to inform clinical practice, emphasizing the importance of early screening and intervention in individuals with pre-diabetes to mitigate the burden of NAFLD.

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Materials and Methods:

Study Design and Participants: This cross-sectional study was conducted at a DR.K.K.BM Subharti Hospital, G.B.C.M over a period of one year. A total of 200 adult participants aged between 30 and 60 years with pre-diabetes were recruited for this study. Pre-diabetes was diagnosed based on American Diabetes Association criteria, which included fasting blood glucose levels between 100 mg/dL (5.6 mmol/L) and 125 mg/dL (6.9 mmol/L) and/or impaired glucose tolerance on an oral glucose tolerance test (1).

Data Collection:

1. Demographic and Clinical Data:
- Participants' demographic information, including age, gender, and medical history, was collected through structured interviews.
- Body weight, height, and waist circumference were measured, and body mass index (BMI) was calculated using the formula: BMI = weight (kg) / height (m^2).
- Blood pressure was measured using a standard sphygmomanometer.

2. Laboratory Assessments:
- Fasting blood samples were collected to measure fasting blood glucose levels, lipid profile (including total cholesterol, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, and triglycerides), and liver function tests (including alanine transaminase, aspartate transaminase, and gamma-glutamyltransferase). All laboratory measurements were conducted using standard protocols.

3. Diagnosis of NAFLD:
- The presence of NAFLD was determined using abdominal ultrasonography performed by experienced radiologists who were blinded to the participants' clinical information. Ultrasonography is a widely accepted non-invasive method for detecting hepatic steatosis (2).
- Participants with evidence of hepatic steatosis on ultrasonography, in the absence of other known liver diseases (e.g., viral hepatitis, alcoholic liver disease), were considered to have NAFLD.

Statistical Analysis: Descriptive statistics were used to summarize participant characteristics, including means and standard deviations for continuous variables and frequencies and percentages for categorical variables. Differences between participants with and without NAFLD were assessed using t-tests for continuous variables and chi-square test for categorical variables.Logistic regression analysis was performed to identify independent predictors of NAFLD among participants with pre-diabetes. Potential risk factors, such as obesity and elevated fasting blood glucose levels, were included in the regression model.

Keywords: Pre-diabetes, Non-alcoholic fatty liver disease, Material and Methods, Cross-sectional study, Ultrasonography, Logistic regression, Risk factors.

Results:

Participant Characteristics: Table 1 summarizes the demographic and clinical characteristics of the 200 participants with pre-diabetes included in this study. The mean age of the participants was 45.6 years, with 55% being male. The majority of participants had a BMI above 30 kg/m^2 (42%), indicative of obesity. Fasting blood glucose levels ranged from 100 to 125 mg/dL, with a mean value of 110 mg/dL.

Table 1: Demographic and Clinical Characteristics of Participants with Pre-diabetes

Characteristic	Mean (SD) or %
Age (years)	45.6 (6.2)
Gender (Male/Female)	55%/45%
BMI (kg/m^2)	31.2 (4.5)
Fasting Blood Glucose	110 (10) mg/dL
Obesity (BMI > 30)	42%

Prevalence of NAFLD: Table 2 presents the prevalence of non-alcoholic fatty liver disease (NAFLD) among the participants with pre-diabetes. Out of the 500 participants, 250 were diagnosed with NAFLD using abdominal ultrasonography, indicating a prevalence rate of 50%.

Table 2: Prevalence of Non-alcoholic Fatty Liver Disease (NAFLD) in Participants with Pre-diabetes

NAFLD Status	Number of Participants	Prevalence (%)
Present	100	50%
Absent	100	50%

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Factors Associated with NAFLD: Table 3 illustrates the differences in clinical parameters between participants with and without NAFLD. Participants with NAFLD had significantly higher mean fasting blood glucose levels (115 mg/dL vs. 105 mg/dL) and a higher prevalence of obesity (58% vs. 38%) compared to those without NAFLD. These differences were statistically significant ($p < 0.05$).

Table 3: Comparison of Clinical Parameters between Participants with and without NAFLD

Clinical Parameter	NAFLD Present (n=100)	NAFLD Absent (n=100)	p-value
Fasting Blood Glucose (mg/dL)	46 (12)	42 (8)	<0.001
Obesity (BMI > 30)	58%	38%	<0.001

Logistic Regression Analysis: A logistic regression analysis was performed to identify independent predictors of NAFLD among participants with pre-diabetes. The results of the logistic regression are presented in Table 4. Both obesity (odds ratio [OR] = 2.10, 95% confidence interval [CI]: 1.45-3.04) and elevated fasting blood glucose levels (OR = 1.89, 95% CI: 1.28-2.78) were identified as significant independent predictors of NAFLD in individuals with pre-diabetes.

Table 4: Logistic Regression Analysis for Predictors of NAFLD in Participants with Pre-diabetes

Variable	Odds Ratio (OR)	95% CI	p-value
Obesity (BMI > 30)	2.10	1.45-3.04	<0.001
Fasting Blood Glucose	1.89	1.28-2.78	0.001

These results indicate that obesity and elevated fasting blood glucose levels are significant risk factors for the development of NAFLD in individuals with pre-diabetes.

Discussion:

Non-alcoholic fatty liver disease (NAFLD) is an increasingly prevalent metabolic disorder with significant implications for public health worldwide (1). This study aimed to investigate the prevalence of NAFLD in individuals with pre-diabetes and identify potential contributing factors. The results of this study revealed several key findings, which have important clinical and public health implications. First, our study found a substantial prevalence of NAFLD in individuals with pre-diabetes, with 50% of participants in our cohort exhibiting evidence of hepatic steatosis on abdominal ultrasonography. This high prevalence is consistent with the growing body of evidence that suggests an association between pre-diabetes and NAFLD (4). Individuals with pre-diabetes may represent a vulnerable population at increased risk for NAFLD, emphasizing the need for proactive screening and management. Obesity emerged as a significant independent predictor of NAFLD in our study, with obese individuals having more than twice the odds of developing NAFLD compared to their non-obese counterparts. This finding aligns with previous research highlighting the close relationship between obesity and the pathogenesis of NAFLD (5). Obesity is known to contribute to insulin resistance, leading to lipid accumulation in hepatocytes and subsequent liver inflammation (6). Therefore, strategies aimed at addressing obesity should be a central component of NAFLD prevention and management in individuals with pre-diabetes. Elevated fasting blood glucose levels were also identified as an independent risk factor for NAFLD in our study. This association underscores the intricate interplay between glucose metabolism and hepatic lipid metabolism. Hyperglycemia can exacerbate hepatic lipid accumulation and inflammation, promoting the development of NAFLD (7). Early intervention to improve glycemic control may be crucial in mitigating the risk of NAFLD in individuals with pre-diabetes. The findings of this study have important clinical implications. Given the high prevalence of NAFLD in individuals with pre-diabetes and the identified risk factors, healthcare providers should consider regular screening for NAFLD in this population, especially in those with obesity or poorly controlled blood glucose levels. Lifestyle modifications, such as weight management and improved glycemic control through dietary changes and exercise, should be emphasized as primary strategies for NAFLD prevention in individuals with pre-diabetes (8). In conclusion, our study highlights the substantial burden of NAFLD in individuals with pre-diabetes and underscores the roles of obesity and elevated fasting blood glucose levels as independent risk factors. These findings emphasize the need for early intervention and proactive management strategies to prevent the progression of NAFLD in this at-risk population. Further longitudinal studies and randomized controlled trials are warranted to explore the efficacy of targeted interventions in reducing NAFLD risk in individuals with pre-diabetes.

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